CARL VON OSSIETZKY universität OLDENBURG
FAKULTÄT V
INSTITUT FÜR PHYSIK

und

University of Applied Sciences
Fachhochschule EMDEN • LEER

Modulhandbuch

Bachelor of Engineering in Engineering Physics

Stand: 22.02.2010

Contents / Inhaltsverzeichnis

(c) compulsory subject / Pflichtfach
(cos) compulsory optional subject / Wahlpflichtfach

Bachelor of Engineering in Engineering Physics: Course Concept / Übersicht

Field	1 st Semester	2 nd Semester	3 rd Semester	4 th Semester	5 th Semester	6 th Semester	CP/%
Mathematics	Mathematical Methods for Physics and Engineering I (6/9) Computing (5/6)	Mathematical Methods for Physics and Engineering II (4/6)	Mathematical Methods for Physics and Engineering III (4/6)	Numerical Methods (4/6)			33/18
Physics	Mechanics (5/6)	Electro-dynamics and Optics (5/6)	Atomphysik (6/6) Theoretische Physik (Elek-trodynamik) (4/6)	Thermo-dynamik & Statistische Physik (6/6)		Bachelor (2/15) Thesis (-/ 12) *Communication& Presentation See below*	69+12 /39+6
Engineering	Chemistry (2/3)	Electronics (4/6): *Digital (2/3)*	Optische Systeme (2/3) Electronics (4/6): *Analog (2/3)* Basic Engineering (4/4): *Applied Mechanics (2/2)*	Physik. Messtechnik (5/6) Werkstoff-kunde (6/8) *Einführung in die Festkörperphysik (2/2)* *Werkstoffkunde (4/6)* Basic Engineering (4/4): *Production Engineering (2/2)*	Control Systems (5/6) Design Fundamentals (2/3)		
Specialisation		Introduction to Specialisation (4/6)		Specialisation (2/3)	Specialisation (4/6) Specialisation (4/6)		21/12
Laboratory	Basic Laboratory I (4/5) *Course (3/3)*	Basic Laboratory II (4/4) *Course (3/3)*	Laboratory Project I (5/6) *Course (3/4)*		Laboratory Project II (5/6) *Course (3/4)*	Praxisphase (1/12) *Phase (-/10)*	24/13
Communi-cation & Management	*Communication & Presentation (1/2)* Language (4/6): *Language I (2/3)*	*Communication& Presentation (1/1)* Language (4/6): *Language II (2/3)*	*Communication& Presentation (2/2)*		*Communication& Presentation (2/2)* Management (2/3)	Seminar zur Praxisphase (1/2) *Communication& Presentation [Thesis] (2/3)*	21/12
SWS/CP	24/32	21/28	25/32	25/31	22/30	3/27	120/180

Module/*Course* (Hours per Week/ ECTS-Credit Points)
Lectures written in small and cursive style are part of a module
* Language: English (language of not indicated modules is German)

Subject of Specialisation:

Biomedical Physics, Laser & Optics, Sound & Vibration, Renewable Energy, Materials Science

The modules will not be offered every semester.
Die Module aus dem Wahlpflichtbereich sind eine Auswahl von Veranstaltungen, die in der Regel nicht ausschließlich für EP angeboten werden, sondern mit dem Angebot der Vertiefungsrichtungen in Physik und Photonik übereinstimmen. Die Veranstaltungen werden in der Regel nicht jedes Semester angeboten.

Overview of modules / Modulübersicht mit Verantwortlichkeiten

Module/Modul	Person in Charge/ Modulverant-Wortlicher	University/ Hochschule	Assessment/ Prüfungsform *
Field Mathematics			
Computing	Bartning	Emden	Klausur & Hausarbeit
Mathematical Methods for Physics and Engineering I	NN Signalverarbeitung	Oldenburg	Klausur oder mündl. Prüfung
Mathematical Methods for Physics and Engineering II	NN Signalverarbeitung	Oldenburg	Klausur oder mündl. Prüfung
Mathematical Methods for Physics and Engineering III	NN Signalverarbeitung	Oldenburg	Klausur oder mündl. Prüfung
Numerical Methods	Hartmann	Oldenburg	Fachpraktische Übung
Field Physics			
Atomphysik	Lienau, Neu	OL/EMD	mündl. Prüfung
Electrodynamics and optics	Lienau	Oldenburg	Klausur oder mündl. Prüfung
Mechanics	Peinke	Oldenburg	Klausur oder mündl. Prüfung
Theoretical Physics (Electrodynamics)	Pade, Polley	Oldenburg	Klausur oder mündl. Prüfung
Thermodynamik and Statistik	Peinke	Oldenburg	Klausur oder mündl. Prüfung
Field Engineering			
Basic Engineering (Applied Mechanics, Production Engineering)	Nehls	Emden	2 Klausuren
Chemistry	Koch	Emden	Klausur oder mündl. Prüfung
Control Systems	Götting	Emden	Klausur oder mündl. Prüfung
Design Fundamentals	Nehls	Emden	Klausur
Electronics	Brückner	Emden	Klausur
Festkörperphysik	Brückner	Emden	Klausur
Werkstoffkunde	Brückner	Emden	Klausur
Optische Systeme	NN	Emden	Klausur
Physik. Messtechnik	Kollmeier, Kittel	Oldenburg	Klausur oder mündl. Prüfung
Field Laboratory			
Basic Laboratory Course I	Helmers	Oldenburg	Protokolle, Vortrag
Basic Laboratory Course II	Neu	Emden	Protokolle, Vortrag
Laboratory Project I	Brückner	Emden	Fachpraktische Übung
Laboratory Project II	Neu	Emden / Oldenburg	Fachpraktische Übung
Praxisphase	Koch	Oldenburg / Emden	Referat
Field Soft Skills			
Language	Sprachenzentrum	Oldenburg	Sprachprüfung
Management		Oldenburg, Emden	Klausur

Field Specialization					
Acoustical measurement technology	Blau	SV BM	S	Oldenburg	Klausur / Referat
Applied acoustics	Kollmeier	SV BM	S	Oldenburg	Mündl. Prüfung oder Vortrag
Bachelor Thesis	Betreuender Professor			Oldenburg, Emden	Thesis & Kolloqium
Angewandte und medizinische Akustik	Kollmeier	BM	S	Oldenburg	Mündl. Prüfung oder Vortrag
Energiemeterologie	Heinemann	RE	S	Oldenburg	Mündl. Prüfung oder Hausarbeit
Femtosecond Laser Technology	Teubner	LO	S	Emden	Klausur
Introduction to subject of specialization	Neu, Poppe, Peincke, Doclo	all		Oldenburg, Emden	Klausur
Laser Design	Struve	LO	W	Emden	Klausur / Hausrabeit
Laser Physics	Struve	LO	S	Emden	Klausur
Lasers in Medicine I, II	Neu	LO, BM	W W	Emden	Klausur
Laser Spectroscopy	Neu	LO, MS, RE	W	Emden	Klausur / mündl. Prüfung
Materialbearbeitung mit Laserstrahlen I, II	NN	LO, MS	S	Emden	Klausur
Micro Technology	Teubner	LO	S/ W	Emden	Klausur
Optics of the atmosphere and the ocean	Reuter	RE	W	Oldenburg	Klausur / mündl. Prüfung
Optische Kommunikationstechnik	Brückner	LO	S	Emden	Klausur
Optische Messtechnik	Teubner	LO	W	Emden	Klausur
Optoelektronik	Brückner	LO	S	Emden	Klausur
Physikalische Grundlagen der Photovoltaik	Riedel	RE	W	Oldenburg	Mündl. Prüfung oder Hausarbeit
Vakuum- und Kyrotechnik	Gärtner	MS	S	Emden	Klausur
Werkstoffanalytik	Gärtner	MS	S	Emden	Klausur
Windenergie	Peinke	RE	W	Oldenburg	Klausur, mündl. Prüfung oder Hausarbeit

Klausur = written exam, Mundl. Prüfung = oral exam, Hausarbeit = homework, Fachpraktische Übung = excersises, Vortrag = presentation

Subject of Specialisation: BM Biomedical Physics,
LO Laser & Optics,
SV Sound & Vibration,
RE Renewable Energy,
MS Materials Science

W Winter semester,
S Summer semester

Credit points are calculated with a semester of 14 weeks. Compulsory courses, offered at the University of Applied Sciences Emden/Leer together with other study courses have duration of 16 weeks per semester.
Der Berechnung der Präsenzzeit und des Selbststudiums wurde eine Semesterdauer von 14 Wochen zugrunde gelegt. Die Pflichtkurse, die an der FH OOW zusammen mit anderen Studiengängen angeboten werden, haben eine Dauer von 16 Wochen.

1st Semester, compulsory subjects:

Module description:	**Mathematical Methods for Physics and Engineering I (c)**
Field:	Mathematics
Course:	Mathematical Methods for Physics and Engineering I, lecture Mathematical Methods for Physics and Engineering I, exercise
Term:	Winter
Person in charge:	N.N. Signalverarbeitung
Lecturer:	N.N. Signalverarbeitung; Dr.-habil L. Polley, NN Mathematik
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 1st semester
form/time:	Lecture: 4 hrs/week Exercise: 2 hrs/week
Workload:	attendance: 84 hrs self study: 186 hrs
CP:	9
Prerequisites acc. Syllabus	
Recommended prerequisites:	
Aim:	To obtain basic knowledge in application of mathematical methods to solve problems in physics and engineering
Content:	Preliminary algebra (polynomial equations, binomial expansion, proof by induction and contradiction, vectors in 2- and 3-space, products, planes, lines) Preliminary calculus (elementary function, operations, limits, diffenretiation, integration) Preliminary complex analysis Preliminary vector algebra, matrices, linear equations Determinants, transformations Introduction to differential equations
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, computer presentation
Literature:	K. F. Riley, M. P. Hobson, S. J. Bence: Mathematical methods for physics and engineering. Third edition, 2006

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Module description:	**Computing (c)**
Field:	Mathematics
Course:	Computing, lecture Computing, tutorial
Term:	Winter
Person in charge:	Prof. Dr. B. Bartning
Lecturer:	Prof. Dr. B. Bartning, NN
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 1st semester
form/time:	Lecture: 3 hrs/week Tutorial: 2 hrs/week
Workload:	Attendance: 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. Syllabus	
Recommended prerequisites:	Basic computer knowledge; knowledge in undergraduate physics
Aim:	Students acquire knowledge of the most important ideas and methods of computer science including one programming language.
Content:	General Foundation Computer system (principal computer parts, peripheral devices, software. Operating system with short exercises) Numbers, characters Algorithms (sequence, selection, iteration) Programming language (C++) Structures of algorithms Input/output, preprocessor Arrays, strings Functions (procedural programming) Programme files (modular programming) Short introduction into classes (object orientated programming)
Assessment:	1 hr written exam and homework
Media:	Lecture script, transparencies, blackboard, data projector presentation, reference programs
Literature:	Lecture notes (via internet www.bartning.org); Generel books about C++, z. B. Ulrich Breymann, C++, Eine Einführung, Hanser Bjarne Stroustrup, The C++ Programming Language, Special 3rd Edition, Addison-Wesley 2000.

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Module description:	**Mechanics (c)**
Module	Physics
Course:	Mechanics, lecture Mechanics, exercise
Term:	Winter
Person in charge:	Prof. Peinke
Lecturer:	Prof. Peinke, Prof Lienau, Dr. Reuter
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 1st semester
form/time:	Lecture: 4 hrs/week Exercise: 2 hrs/week
Workload:	Attendance: 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. Syllabus	
Recommended prerequisites:	Basic knowledge of mathematics acc the pre-course of mathematics
Aim:	Introduction into scientific reasoning; understanding the basic physical principles that govern physical behaviour in the real world, application of these principles to solve practical problems. General introduction to the fundamentals of experimental mechanics.
Content:	Scientific reasoning Space and Time Kinematics Dynamics Motion in accelerated frames Work and Energy Laws of Conservation Physics of rigid bodies Deformable bodies and fluid media Oscillations Waves
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	D. Halliday, R. Resnick, J. Walker, S. W. Koch: Fundamentals of physics / Physik. Wiley-VCH, Weinheim, 2003 P. A. Tipler, G. Mosca, D. Pelte, M. Basler: Physics/Physik. Spektrum Akademischer Verlag, 2004 W. Demtröder: Experimentalphysik, Band 1: Mechanik und Wärme. Springer, Berlin, 2004 L. Bergmann, C. Schäfer, H. Gobrecht: Lehrbuch der Experimentalphysik, Band 1: Mechanik, Relativität, Wärme. De Gruyter, Berlin, 1998

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Module description:	**Chemistry (c)**
Field:	Engineering
Course:	Chemistry, lecture Chemistry, laboratory
Term:	Winter
Person in charge:	Dipl.-Ing. (FH) Koch
Lecturer:	Dipl.-Ing. (FH) Koch
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 1st semester
form/time:	Lecture: 2 hrs/week, Laboratory: 8 hrs
Workload:	Attendance: 28 + 6 hrs Self study: 56 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	Students acquire knowledge of principles in chemistry and fluorescent substances
Content:	Atomic model Periodic system of the elements Chemical bond Quantitative relations, stoichiometry Chemical equilibria Acid / base equilibria Redox processes Fluorescent substances Basic lab work
Assessment:	1 hr written exam or 0.5 hr oral exam
Media:	Lecture script, transparencies, blackboard, data projector presentation
Literature:	G. Jander, E. Blasius, J.Strähle, E. Schweda: Lehrbuch der analytischen und präparativen anorganischen Chemie. Hirzel, Stuttgart, 2006 E. Riedel, C Janiak: Anorganische Chemie. Gruyter, 2007 C. E. Mortimer, U. Müller: Chemie. Das Basiswissen der Chemie. Thieme, 2007 N. Wiberg, A. F. Holleman, E. Wiberg: Holleman-Wiberg's Inorganic Chemistry. Academic Press, 2001

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Module description:	**Basic Laboratory I (c)**
Field:	Laboratory and Communication & Management
Course:	Basic Laboratory Course I Communication & Presentation
Term:	Winter
Person in charge:	Dr. Helmers
Lecturer:	Dr. Helmers and others
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 1st semester
form/time:	Laboratory: 3 hrs/week Communication and presentation: 1 hr/week
Workload:	attendance: 56 hrs self study: 94 hrs
CP:	5
Prerequisites acc. syllabus	
Recommended prerequisites:	Simultaneous hearing of Mechanics lecture
Aim:	Getting familiar with standard laboratory equipment including software for scientific data analysis, learning to perform and document experiments, learning to analyze and understand experimental results
Content:	Introduction to software for scientific data analysis, analysis and assessment of measurement uncertainties, dealing with modern measurement techniques, carrying out experiments in the fields of mechanics, electricity, optics, nuclear radiation, electronics, signal acquisition, signal processing.
Assessment:	Successful execution and record keeping of the experiments, presentation of the results in lectures.
Media:	English and German Script (see http://www.physik.uni-oldenburg.de/Docs/praktika/10319.html), blackboard, Beamer presentation
Literature:	see http://www.physik.uni-oldenburg.de/Docs/praktika/12124.html

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Module description:	**Language (c)**
Field:	Communication & Management
Course:	Language Course I and II (German, other language courses are possible)
Term:	Winter and Summer
Person in charge:	B. Henning
Lecturer:	Sprachenzentrum
Language:	German (or as desired)
Curriculum correlation:	1st and 2nd semester B.Eng. Engineering Physics
form/time:	4 SWS per Semester (other languages may differ)
Workload:	attendance: 56 hrs per Semester self study: 42 hrs per Semester 2 intensive course (each 72 hrs)
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	The student can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). He/She can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. She/he can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need. Other language courses are in accordance with the guidelines given by the “Sprachenzentrum”
Content:	• Reading • Writing • Listening • Speaking • Lecturing • Grammar in scientific papers
Assessment:	Written and oral examination acc. requirements (“Sprachprüfung” in accordance with: *Common European Framework of Reference for Languages* **CEFR** : level A2)
Media:	Black board, PC, language laboratory
Literature:	Dallapiazza, von Jan, Schönherr, Tangram. Deutsch als Fremdsprache, Lehrerbuch 1A u. 1B, 1999

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2nd Semester, compulsory subjects:

Module description:	**Mathematical Methods for Physics and Engineering II (c)**
Field:	Mathematics
Course:	Mathematical Methods for Physics and Engineering II, lecture Mathematical Methods for Physics and Engineering II, excersice
Term:	Summer
Person in charge:	N.N. Signalverarbeitung
Lecturer:	N.N. Signalverarbeitung; Dr.-habil Polley, NN Mathematik
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 2nd semester
form/time:	Lecture: 2 hrs/week Exercise: 2 hrs/week
Workload:	attendance: 56 hrs self study: 124 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Mathematical Methods for Physics and Engineering I
Aim:	To obtain advanced knowledge in application of mathematical methods to solve problems in physics and engineering
Content:	Vector calculus Vector algebra Partial differentiation Line, surface, volume, multiple integrals Fourier series and transform Ordinary differential equations
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, computer presentation
Literature:	K. F. Riley, M. P. Hobson, S. J. Bence: Mathematical methods for physics and engineering. Third edition, 2006

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Module description:	**Electrodynamics and optics (c)**
Field:	Physics
Course:	Electrodynamics and optics, lecture Electrodynamics and optics, exercise
Term:	Summer
Person in charge:	Prof. Dr. Lienau
Lecturer:	Prof. Dr. Lienau
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 2nd semester
form/time:	Lecture: 4 hrs/week Exercise: 2 hrs/week
Workload:	Attendance 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Mechanics
Aim:	Students will be able to understand the electric and magnetic phenomena and their treatment by an electromagnetic field including electromagnetic waves - with special emphasis on light.
Content:	Basics of Electrostatics Matter in an electric field The magnetic field Motion of charges in electric and magnetic fields Magnetism in matter Induction Electromagnetic waves Light as electromagnetic wave
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	D. Meschede: Gerthsen, Physik. Springer, Berlin, 2005 (available in English) P. A. Tipler, G. Mosca, D. Pelte, M. Basler: Physik. Spektrum Akademischer Verlag, 2004 W. Demtröder: Experimentalphysik, Band 2: Elektrizität und Optik. Springer, Berlin, 2004 (available in English) H. Hänsel, W. Neumann: Physik. Elektrizität, Optik, Raum und Zeit. Spektrum Akademischer Verlag, Heidelberg, 2003 S. Brandt, H. D. Dahmen: Elektrodynamik. Eine Einführung in Experiment und Theorie. Springer, Berlin, 2005 W. Greiner: Klassische Elektrodynamik. Harri Deutsch, Frankfurt, 2002 E. Hecht: Optik. Oldenbourg, München, 2005

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Module description:	**Electronics (c)**
Field:	Engineering
Course:	Electronics (digital), lecture and exercise
Term:	Summer
Person in charge:	Prof. Dr. Brückner
Lecturer:	Prof. Dr.Brückner
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 2nd semester
form/time:	Lecture 2 hrs/week Exercise 1 hr/wek
Workload:	Attendance: 32 hrs Self study: 57 hrs including preparation for examination
CP:	3
Prerequisites acc. syllabus	Simultaneous attendance of lecture "Electrodynamics and Optics"
Recommended prerequisites:	Fundamentals of static electrical circuits
Aim:	The students aquire knowledge to understand electronic circuits.
Content:	Digital electronics: logical elements and functions, analysis and synthesis of logical circuits, time dependent circuits, Flip-Flops, digital counters and memories, DA-/AD-converters
Assessment:	2 hrs written examination
Media:	Blackboard, transparents and beamer projections, electronic hand-outs
Literature:	Böhmer: Elemente der angewandten Elektronik, Vieweg Verlag Beuth: Digitalelektronik, Vogel Fachbuch Verlag, 2007 Kories, Schmidt-Walter: Taschenbuch der Elektronik, Verlag Harri Deutsch, 2006 Beuth, Schmusch: Grundschaltungen (Serie Elektronik, 3), Vogel Fachbuch Verlag, 2003 Hering, Bressler, Gutekunst: Elektronik für Ingenieure und Naturwissenschaftler, Springer Verlag, 2005 Excerpts from lecture script Horowitz, Hill: The Art of Electronics, Cambridge University Press, 1989, ISBN 0521370957, 9780521370950

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Module description:	**Introduction to subject of specialization (c)**
Field:	Specialisation
Course:	Introduction to subject of specialization Laser and Optics; Sound and Vibration, Biomedical Physics, Renewable Energy, Materials Science
Term:	Summer
Person in charge:	Prof. Dr. Neu
Lecturer:	Neu, Doclo, Poppe, Peincke, Parisi (Ringvorlesung)
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 2nd semester
form/time:	Lecture 4 hrs/week
Workload:	Attendance: 56 hrs Self study: 124 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	Laser and Optics: Knowledge of the characteristics of waves, optical radiation, design und function of optical elements and instruments, basics of design of new measurement techniques, knowledge of physical and technical properties of optoelectronic components, ability to design and analyze simple optoelectronic systems Sound and Vibration: To introduce the participants to fundamental acoustic concepts and to give the necessary background for more specialised courses in acoustics ranging from acoustic communication and virtual reality to control of noise and vibration. Biomedical Physics: Overview over the fields of research in Oldenburg related to biomedical physics (audiology, biomedical signal processing, neuro-sensory science and systems, medical radiation therapy, medical imaging) Renewable Energy: Introduction into the areas of renewable energies, with special emphasis on energy conversion and utilization, based on complex physical models. The student will be able to understand the fundamental principles of the field renewable energies. Materials Science: Introduction into the areas of materials science, with special emphasis on condensed matter / solid state physics and the specific characteristics, theoretical background, and experimental methods. The student will be able to understand inventions and design of modern innovative components and measurement processes
Content:	Basic introduction into the diverse areas of the miscellaneous fields of specialization
Assessment:	Written examination
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.

Literature:	acc. the necessity of the different areas

Module description:	**Basic Laboratory II (c)**
Field:	Laboratory and Communication & Management
Course:	Basic Laboratory Course II Communication & Presentation
Term:	Summer
Person in charge:	Prof. Dr. Neu
Lecturer:	Photonik (Physik)
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 2nd semester
form/time:	Laboratory: 3 hrs/week (Campus Emden) Communication & Presentation: 1 hr/week (Campus Emden)
Workload:	Attendance: 56 hrs self study: 64 hrs
CP:	4
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic laboratory course I
Aim:	Students acquire knowledge and hands-on experience on experimental laboratory work, managing experimental work. The students will have an insight into research and development projects.
Content:	Polarisation Optics Acoustics Electronics, A/D - conversion Electronics, Amplifier Plastic optical fibres Prism spectroscopy Optics basics Holography Kundtsches Rohr Microwaves GPR Physik, part II is possible on request only
Assessment:	10 reports and colloquiums
Media:	Script, experiments.
Literature:	E. Hering, R. Martin, M. Stohrer: Physik für Ingenieure. Springer. 2007 E. Hecht: Optik. Oldenbourg, 2005 D. Loyd: Physics Lab Manual. Brooks Cole; 3 edition, 2007, ISBN 978-0495114529 D. Halliday: Fundamentals of Physics. Wiley; 8th edition, 2007. ISBN 978-0470044728 R.D. Knight: Physics for Scientists and Engineers, Addison Wesley, 2nd ed., 2007, ISBN 978-0321513335 M. Alley: The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid. Springer, 5th ed., 2003. ISBN 978-0387955551

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3rd Semester, compulsory subjects:

Module description:	**Mathematical Methods for Physics and Engineering III (c)**
Field:	Mathematics
Course:	Mathematical Methods for Physics and Engineering III, lecture Mathematical Methods for Physics and Engineering III, exercise
Term:	Winter
Person in charge:	N.N. Signalverarbeitung
Lecturer:	N.N. Signalverarbeitung; Dr.-habil. Polley, NN Mathematik
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 3rd semester
form/time:	Lecture: 2 hrs/week Exercise: 2 hrs/week
Workload:	attendance: 56 hrs self study: 124 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Mathematical Methods for Physics and Engineering II
Aim:	To obtain advanced knowledge in application of mathematical methods to solve problems in physics and engineering
Content:	Complex analysis Partial differential equations Special functions inphysics and engineering Special integral transform in physics and engineering Special linear and nonlinear differential equations in physics and engineering Statistics
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, computer presentation
Literature:	K. F. Riley, M. P. Hobson, S. J. Bence: Mathematical methods for physics and engineering. Third edition, 2006

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Module description:	**Atomphysik (c)**
Field:	Physics
Course:	Atomic physics, lecture Atomic physics, exercise
Term:	Winter
Person in charge:	Prof. Dr. Lienau, Prof. Dr. Bauer
Lecturer:	Prof. Dr. Lienau, Prof. Dr. Bauer
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 3rd semester Fach-Bachelor in Physik, Pflicht, 3rd Semester Zwei-Fächer-Bachelor in Physik, 3rd Semester
form/time:	Lecture: 4 hrs/week Exercise: 2 hrs/week
Workload:	Attendance: 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	courses experimental physics I and II
Aim:	Students learn the fundamental principles of the atomic and molecular physics in differentiation to the classical physics.
Content:	development of the concept of atoms angular momentum and spin, and magnetic properties of the electrons, periodic system of the elements wave-particle dualism of electrons and photons modern experimental methods introduction to quantum mechanics: wave packets, Schrodinger equation, Heisenberg uncertainty principle applications: the electron in the box, the harmonic oscillator, the hydrogen atom
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	W. Demtröder: Experimentalphysik, Band 3: Atome, Moleküle, Festkörper. Springer, Berlin, 2000 (available in English) H. Haken, H. C.Wolf: Atom- und Quantenphysik. Springer, Berlin 2004 H. Haken, H. C. Wolf: Molekülphysik und Quantenchemie. Springer, Berlin, 2004 (available in English) H.-J. Leisi: Quantenphysik. Springer, Berlin, 2004 G. Otter, R. Honecker: Atome, Moleküle, Kerne. Teubner, Stuttgart, 1998 B. Thaller: Visual Quantum Mechanics – Selected topics with computer generated movies of quantum mechanical phenomena. Springer, Berlin, 2002.

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Module description:	**Theoretische Physik (Elektrodynamik) (c)**
Field:	Physics
Course:	Theoretical Physics II (Elektrodynamics), lecture Theoretical Physics II (Elektrodynamics), exercise
Term:	Winter
Person in charge:	Dr. Pade, PD Dr. Polley
Lecturer:	Dr. Pade, PD Dr. Polley
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 3rd semester
form/time:	Lecture: 2 hrs/week Exercise: 2 hrs/week
Workload:	Attendance: 56 hrs Self study: 124 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	Obtain expertise to analyze and understand theoretically the basic concept of electrodynamics
Content:	Basic concept and structure of classical electrodynamics and theory of relativity Field, wave, potential of moving charges boundary value problem differentiation between relativistic and non-relativistic problems electrodynamics in matter Lorenz transformation
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	T. Fließbach; Lehrbuch zur theoretischen Physik, Spektrum Verlag, 2003 W. Nolting: Grundkurs Theoretische Physik 3 (Elektrodynamik) und 4 (Spezielle Relativitätstheorie, Thermodynamik), Springer Verlag, 2001 J.D. Jackson: Klassische Elektrodynamik, de Gruyter, 2006 (available in English) R.P. Feynman et al.: Vorlesungen über Physik, Band 2, Oldenbourg, 2001 (available in English) A.P. French: Die spezielle Relativitätstheorie, Vieweg, 1982

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Module description:	**Electronics (c)**
Field:	Engineering
Course:	Electronics (analog), lecture and exercise
Term:	Summer
Person in charge:	Prof. Dr. Brückner
Lecturer:	Prof. Dr.Brückner
Language:	German/English, bilingual
Curriculum correlation:	Bachelor Engineering Physics, 2nd semester Bachelor Photonics, 1st term
form/time:	Lecture 2 hrs/week Exercise 1 hr/wek
Workload:	Attendance: 32 hrs Self study: 57 hrs including preparation for examination
CP:	3
Prerequisites acc. syllabus	Simultaneous attendance of lecture "Electrodynamics and Optics"
Recommended prerequisites:	Fundamentals of static electrical circuits
Aim:	The students aquire knowledge to understand electronic circuits.
Content:	Analog electronics: time dependence of capacitors and inductances, complex numbers, calculation of alternating current circuits, RCL-circuits, electronic filters, complex transfer functions, pulse response, semiconductor diodes, rectification circuits, operational amplifiers and amplifier circuits
Assessment:	2 hrs written examination
Media:	Blackboard, transparents and beamer projections, electronic hand-outs
Literature:	Böhmer: Elemente der angewandten Elektronik, Vieweg Verlag Beuth: Digitalelektronik, Vogel Fachbuch Verlag, 2007 Kories, Schmidt-Walter: Taschenbuch der Elektronik, Verlag Harri Deutsch, 2006 Beuth, Schmusch: Grundschaltungen (Serie Elektronik, 3), Vogel Fachbuch Verlag, 2003 Hering, Bressler, Gutekunst: Elektronik für Ingenieure und Naturwissenschaftler, Springer Verlag, 2005 Excerpts from lecture script Horowitz, Hill: The Art of Electronics, Cambridge University Press, 1989, ISBN 0521370957, 9780521370950

Module description:	**Optische Systeme (c)**
Field:	Engineering
Course:	Optical Systems, lecture Optical Systems, exercise
Term:	Winter
Person in charge:	N.N.
Lecturer:	Dipl.-Phys. Schellenberg
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 3rd semester Bachelor Photonik
form/time:	Lecture 2 SWS with excercises
Workload:	Attendance: 32hrs Self study: 58
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Knowledge of the use of mathematical equations Knowledge of basic physical
Aim:	The students should be able with the help of optics basics to apply the optics to solve questions of informatics and measurement technology illumination technology materials processing with laser beams and the development of optical mechanical instruments and systems to implement the field of optics and to solve engineering questions.
Content:	Summary of optical basics: Technical optics as basics Optical rays Behaviour and Eigenschaften of electromaagnetic waves Application of waveoptic properties Area of validity and low of geometric optics Application of ray optic laws Oprical image Imaging construction elements Ray bundle, bundle limitation Physics of rays and light Colours Optical systems Set-up and function of selected optical systems of the ilumintation technology Measurement technology Material processing with laser beams Communication technology
Assessment:	2 hrs, written exam
Media:	Black bord, slides, electronic script
Literature:	Waren J. Smith: Modern Optical Engineering, Mc Graw Hill, 4th edition, 2008 G. Schröder: Technische Optik, Vogel Verlag Würzburg, 2007 Skriptum

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Module description:	**Basic Engineering (c)**
Field:	Engineering
Course:	Applied Mechanics
Term:	Winter
Person in charge:	Prof. Dr.-Ing. Nehls
Lecturer:	Prof. Dr.-Ing. Nehls
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 3rd semester Bachelor Photonik
form/time:	Lecture with integrated sample problems and exercises / 2 hrs/week
Workload:	Attendance: 32 hrs Self study: 28 hrs
CP:	2
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic Math (Algebra, Derivation, Integration)
Aim:	Achieving basic knowledge in applied mechanics, especially in statics and elasticity theory
Content:	Static equilibrium (mainly 2D), frame works, friction (Coulomb), Hooke's law (3D including lateral contraction and thermal expansion), bending and torsion with planar cross sections, Mohr's theory
Assessment:	Written exam, 1hr.
Media:	Beamer, black board, electronic scripts
Literature:	Assmann: Technische Mechanik (German); Meriam, Kraige: Engineering Mechanics, Beer, Russell, Johnston: Vector Mechanics for Engineers

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Module description:	**Laboratory Project I (c)**
Field:	Laboratory and Communication & Management
Course:	Laboratory Project I Communication & Presentation
Term:	Winter
Person in charge:	Prof. Dr. Brückner
Lecturer:	Prof. Dr. Brückner et al.
Language:	English/German
Curriculum correlation:	Bachelor Engineering Physics, 3rd semester
form/time:	Laboratory: 3 hrs/week (Campus Emden) Communication & Presentation: 2 hrs/week (Campus Emden)
Workload:	Attendance: 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. syllabus	Lecture "Electronics"
Recommended prerequisites:	Basic laboratory course I & II
Aim:	Knowledge and experience about experimental work, managing experimental work and avaluating results
Content:	Experiments in the field of electronics and measurement technique
Assessment:	12 reports and colloquiums, project presentation
Media:	
Literature:	Specific project descriptions

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4th Semester, compulsory subjects:

Module description:	**Numerical Methods (c)**
Field:	Mathematics
Course:	Numerical methods, lecture Numerical methods, tutorial
Term:	Summer
Person in charge:	Prof. Hartmann, PD Dr. Hohmann
Lecturer:	Prof. Hartmann, PD Dr.HohmannDr. Brand, PD Polley
Language:	German (tutorials and materials also in English)
Curriculum correlation:	Bachelor Engineering Physics, 4th semester Fach-Bachelor in Physik, Pflicht, 4th Semester
form/time:	Lecture: 2 hrs/week Tutorial: 2 hrs/week
Workload:	Attendance: 56 hrs Self study: 124hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic computer knowledge; knowledge in undergraduate physics
Aim:	Students acquire theoretical knowledge of basic numerical methods and practical skills to apply these methods on physical problems within all areas of experimental, theoretical and applied physics.
Content:	Basic concepts of numerical mathematics are introduced and applied to physics problems. Topics include: finite number representation and numerical errors linear and nonlinear systems of equations numerical differentiation and integration function minimization and model fitting discrete Fourier analysis ordinary and partial differential equations. The learned numerical methods will be partly implemented (programmed) and applied to basic problems from mechanics, electrodynamics, etc. in the exercises. The problems are chosen so that analytical solutions are available in most cases. In this way, the quality of the numerical methods can be assessed by comparing numerical and analytical solutions. Programming will be done in Matlab, which is a powerful package for numerical computing. It offers easy, portable programming, comfortable visualization tools and already implements most of the numerical methods introduced in this course. These built-in functions can be compared to own implementations or used in the exercises in some cases when own implementations are too costly. An introduction to Matlab will be given at the beginning of the tutorial.
Assessment:	Weekly graded programming exercises
Media:	Lecture script, transparencies, blackboard, data projector presentation, reference programs
Literature:	V. Hohmann: Computerphysik: Numerische Methoden (lecture script). Universität Oldenburg, http://medi.uni-oldenburg.de/16750.html W. H. Press et al.: Numerical Recipes in C - The Art of Scientific Computing. Cambridge University Press, Cambridge, 1992 A. L. Garcia: Numerical Methods for Physics. Prentice Hall, Englewood Cliffs (NJ), 1994 J. H. Mathews: Numerical Methods for Mathematics, Science and Engineering. Prentice Hall, Englewood Cliffs (NJ), 1992

	B.W. Kernigham und D. Ritchie: The C Programming Language, Prentice Hall International, Englewood Cliffs (NJ), 1988

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Module description:	**Thermodynamik und Statistik (c)**
Field:	Physics
Course:	Thermodynamics and Statistics, lecture Thermodynamics and Statistics, exercise
Term:	Summer
Person in charge:	Prof. Peinke
Lecturer:	Prof. Peinke, (Neuberufung W2 Experimentalphysik)
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 4th semester Fach-Bachelor in Physik, Pflicht, 4th Semester Zwei-Fächer-Bachelor in Physik, LA Gymnasium, Pflicht, 4th Semester Zwei-Fächer-Bachelor in Physik, LA GHR, Pflicht, 4th Semester
form/time:	Lecture: 4 hrs/week Exercise: 1 hrs/week
Workload:	attendance: 70 hrs self study: 110 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	courses experimental physics 1, 2, 3
Aim:	Procurement of fundamental principals of thermodynamics and statistical physics to enable students to understand and analyze formulation of relations for particle ensembles with appropriate magnitudes.
Content:	I PHENOMENOLOGICAL THERMODYNAMICS A Fundamental Concepts Temperature, thermal equilibrium, 0. law, heat, internal energy, work from a system, first law , thermodynamic states and processes, thermodynamic cycles, B Application of Fundamental Concepts Carnot and Stirling cycle, second law, entropy, Legendre Transform and potential functions (Free Energy, Enthalpy, Gibb's Potential), irreversible processes and change in entropy, C Open Systems, Real Gases, Phase Transitions II STATISTICS 1 Isotropic particle distribution in space 2 Diffusion (1-dim) via particle hopping 3 entropy changes with volume alteration 4 energy distribution for distinguishable particles (Boltzmann- and Maxwell-distribution) 5 energy distribution for non-distinguishable Particles (Fermi-Dirac-, and Bose-Einstein-distribution) 6 Black Body Radiator (Planck's law) 7 Saha-Equation
Assessment:	Successful attendance of the weekly exercises, 3 hrs written exam or 45 min oral exam
Media:	Script, transparencies, blackboard, beamer presentation, experiments.
Literature:	M. W. Zemansky, R. H. Dittman: Heat and Thermodynamics. McGraw-Hill, New York, 1997;

	Van P. Carey: Statistical thermodynamics and microscale thermophysics, Cambridge University Press, Cambridge (UK) 1999; H. B. Callen: Thermodynamics. John Wiley, New York, 1978; C. Kittel, H. Krömer: Physik der Wärme. Oldenbourg, München, 1993; D. K. Kondepudi, I. Prigogine: Modern thermodynamics. John Wiley, New York, 1998;

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Module description:	**Physikalische Messtechnik (c)**
Field:	Engineering
Course:	Signalverarbeitung,lecture Physikalische Messtechnik, lecture Signalverarbeitung / Physikalische Messtechnik, excercise
Term:	Summer
Person in charge:	Prof. Dr. Dr. Kollmeier, PD. Dr. Kittel
Lecturer:	Prof. Dr. Dr. Kollmeier, , PD. Dr. Kittel, Dr. Reuter, Dr. Hohmann
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 4th semester Fach-Bachelor in Physik, Pflicht, 4th Semester
form/time:	Lecture: 4 hrs/week Exercise: 1 hrs/week
Workload:	Attendance: 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	Procurement of fundamental principals of metrology to enable the student to analyze, understand and solve the principle problems of measurement techniques.
Content:	Sensors for measurements of the different physical quantities Data logging and processing Measuring systems
Assessment:	2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	H.-R. Tränkler, E. Obermeier: Sensortechnik. Springer, Berlin, 1998 J. Niebuhr, G. Lindner: Physikalische Messtechnik mit Sensoren. Oldenbourg, München, 2001 J. F. Keithley [Ed.]: Low /Level Measurements Handbook. Keithley Instruments Inc., 1998 J.-R. Ohm, H. D. Lüke: Signalübertragung. Springer, Berlin, 2005 K.-D. Kammeyer, K. Kroschel: Digitale Signalverarbeitung: Filterung und Spektralanalyse mit MATLAB-Übungen. Teubner, Stuttgart, 2002 Fourieranalyse

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Module description:	**Werkstoffkunde (c)**
Field:	Engineering
Course:	Werkstoffkunde,Materials Science, lecture
Term:	Summer
Person in charge:	N.N.
Lecturer:	N.N.
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 4th semester Bachelor Photonics, 4th semester
form/time:	Lecture 3 hrs/week Laboratory 1 hr/week
Workload:	Attendance: 64 hrs Self study: 116 hrs including preparation for examination
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Knowledge of the fundamental physical laws; poised use of the mathematical methods of physics
Aim:	The students are able - outgoing from the microscopic structure of engineering materials - to understand its macroscopic properties, so that they are able to involve the behaviour of engineering materials into engineering requirements independently
Content:	Introduction Classification of engineering materials in groups Constitution of engineering materials (microscopic structure, macroscopic properties) Physical basics of constitution: Constitution of single phase solids (crystals, amorphous materials, real materials) Constitution of multi-phase materials Basic diagrams of constitution of binary alloys Crystallisation Diffusion Properties of materials Physical properties Mechanical properties (plastic deformation, crack growth, friction, wear) Groups of materials (metals, ceramics, polymers) Selected materials (iron, aluminium, copper) Testing of materials (an overview of methods)
Assessment:	2 hrs written examination
Media:	Blackboard, overhead transparencies, and beamer projections, electronic hand-outs
Literature:	E. Hornbogen: Werkstoffe, Springer Verlag Berlin u. a. W. Bergmann: Werkstofftechnik Teil 1, Grundlagen; Carl Hanser Verlag München Wien Bargel, Schulze: Werkstoffkunde, VDI-Springer W. D. Callister, Jr.: Materials Science and Engineering, An Introduction; John Wiley-VCH Verlag Gmbh Weinheim

Module description:	**Werkstoffkunde** (c)
Field:	Engineering
Course:	Introduction to solid state physics, Einführung in die Festkörperphyik, lecture
Term:	Summer
Person in charge:	Prof. Dr. Brückner
Lecturer:	Prof. Dr. Brückner
Language:	English/German, bilingual
Curriculum correlation:	Bachelor Engineering Physics, 4th semester Bachelor Photonics, 4th semester
form/time:	Lecture 2 hrs/week with integrated exercises
Workload:	Attendance: 32 hrs Self study: 28 hrs including preparation for examination
CP:	2
Prerequisites acc. syllabus	
Recommended prerequisites:	Lecture "Atomic Physics"
Aim:	Acquisition of basic knowledges and methods concerning the physicsl properties of solids
Content:	Crystal lattices and structures Reciprocal lattice 2-level systems, crystal bonds Phonons Specific heat and heat conductivity Free electron gas in crystals Electronic band structure Semiconductor crystals
Assessment:	1 hr written examination
Media:	Blackboard, transparents and beamer projections, electronic hand-outs
Literature:	Kittel: Festkörperphysik, Oldenbourg Verlag, 2006 Ashcroft, Mermin: Solid State Physics, Saunders College Publ., 1995 Ibach, Lüth: Festkörperphysik, Springer Verlag, 2002

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Module description:	**Basic Engineering (c)**
Field:	Engineering
Course:	Production Engineering
Term:	Summer
Person in charge:	Prof. Dr.-Ing. Nehls
Lecturer:	Prof. Dr.-Ing. Nehls
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 4th semester Bachelor Photonik
form/time:	Lecture 2 hrs/week
Workload:	Attendance: 32 hrs Self study: 28 hrs
CP:	2
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic knowledge in Physics (Mechanics, Thermodynamics, esp. Heat transfer)
Aim:	Achieving basic knowledge on how to produce objects with defined geometry and properties in an effective and economic way
Content:	Overview on manufacturing technologies, like • Casting and other primary shaping processes • Plastic deformation processes • Cutting and separating processes • Joining processes • Coating processes • Changing material properties
Assessment:	Written exam, 1hr.
Media:	Beamer, black board, electronic scripts
Literature:	Groover: Fundamentals of Modern Manufacturing DeGarmo: Materials and Processes in Manufacturing König: Fertigungsverfahren (in German)

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5th Semester, compulsory subjects:

Module description:	**Control Systems (c)**
Field:	Engineering
Course:	Control Systems, lecture Control Systems, exercise
Term:	Winter
Person in charge:	Prof. Dr. Götting
Lecturer:	Prof. Dr.Götting
Language:	English
Curriculum correlation:	BA Engineering Physics, 5th semester
form/time:	lecture: 4 hrs/week excersices: 1 hrs/week
Workload:	Attendance: 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Complex numbers, ordinary differential equations, Laplace transformation
Aim:	The course provides an introduction to the principles of control engineering. Students should understand the basic elements, operations and characteristics of control systems. They should know how to analyse, model and design basic control systems. On completion of the course a student should be able to: Explain basic concepts of control systems Model simple electrical and mechanical systems Understand in depth first and second order systems Understand modelling using the state-space approach Determine transfer functions of simple control systems from differential equations Determine stability of feedback systems and evaluate error signals Design feedback control systems using PI, PID controllers Design feedback control systems in frequency domain and using the root locus method
Content:	Modelling of dynamical system, linear time-invariant systems, transfer functions, block diagrams, state space description, transfer functions and state-space description, relationship of pole/zero locations and dynamic response, stability of control systems, design of control systems, PID controller, design methods in the frequency domain, root-locus design method, state-space design
Assessment:	1 h written exam or oral exam
Media:	Blackboard, transparents and beamer projections, electronic hand-outs
Literature:	G.F.Franklin, J.D.Powell, A.Emami-Naeini, "Feedback Control of Dynamic Systems", 3rd Edition, Addison-Wesley, 1994 B.C. Kuo, "Automatic Control Systems", 7th Edition, Prentice-Hall, 1995 R.C. Dorf, R.H. Bishop, “Modern Control Systems”, Addison-Wesley, 1995.

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Module description:	**Design Fundamentals (c)**
Field:	Engineering
Course:	Design Fundamentals
Term:	Winter
Person in charge:	Prof. Dr.-Ing. Nehls
Lecturer:	Udo Hübner
Language:	English
Curriculum correlation:	Bachelor Engineering Physics, 5th semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic knowledge in Applied Mechanics, Production Technologies and Mathematics
Aim:	Achieving basic knowledge in reading, understanding and production of technical drawings, getting and overview about the features of CAD-Software, knowing about the basic principles of designing and dimensioning of machine elements
Content:	Rules and Standards for Technical Drawings, Design Phases: • Functional requirements, performance specifications • Design methodology • Decision processes • Detailing • Manufacturing Drawings • Grouping of parts Basic Machine Elements: • Frames • Joints • Bearings Sealings
Assessment:	Written exam, 1hr.
Media:	Beamer, black board, electronic scripts
Literature:	ISO- and EN- Standards, Childs: Mechanical Design, Ulrich/Eppinger: Product Design and Development, Matousek: Engineering Design

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Module description:	**Laboratory Project II (c)**
Field:	Laboratory and Communication & Management
Course:	Laboratory Project II Communication & Presentation
Term:	Winter
Person in charge:	Prof. Dr. Neu
Lecturer:	Profs. Photonik
Language:	English/German
Curriculum correlation:	Bachelor Engineering Physics, 5th semester
form/time:	Laboratory: 3 hrs/week Communication & Presentation: 2 hrs/week
Workload:	Attendance: 70 hrs Self study: 110 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic laboratory course I & II; Lab project I
Aim:	The students are enabled to systematically explore and structure a given project task. These projects are settled in the field of current research and are worked on in a team. This requires as well project scheduling, definition of milestones, specification and design, literature research, and presentation discussion of results. The students do not only gain technical and experimental experience but do also train soft-skills like team work, communication, presentation and management tasks
Content:	Projects close to current research projects
Assessment:	Report and Presentation
Media:	Script, manuals, experiments.
Literature:	recent publications, as required

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Module description:	**Management (c)**
Field:	Communication & Management
Course:	As required
Term:	Winter
Person in charge:	N.N.
Lecturer:	N.N.
Language:	English / German
Curriculum correlation:	Bachelor Engineering Physics, 5th semester
form/time:	2 SWS
Workload:	Attendance:28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Knowledge of basics and methods of microeconomics
Aim:	The student will be able to understand and apply the basic management concept and basic leadership qualities.
Content:	Basics of general economics Organisation Concept of a company Company philosophy and policies Decision-making-theory Company planning Strategic management
Assessment:	1 hr written exam or 0.5 hr oral exam
Media:	Lecture script, transparencies, blackboard, data projector presentation
Literature:	as required

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6th Semester, compulsory subjects:

Module description:	**Bachelor Thesis (c)**
Field:	Thesis
Course:	Bachelor Thesis & Kommunikation und Präsentation
Term:	Summer
Person in charge:	Teaching Staff Engineering Physics
Lecturer:	N.A.
Language:	German or English
Curriculum correlation:	Bachelor Engineering Physics, 6th semester
form/time:	Seminar and self-learning
Workload:	Attendance: 28 hrs Self study: 422 hrs
CP:	15
Prerequisites acc. syllabus	Bachelor curriculum Engineering Physics
Recommended prerequisites:	
Aim:	Students will apply their diversified scientific and professional skills to plan, prepare, organize and produce single-handed a research study.
Content:	The thesis comprises empirical, theoretical or experimental research and development according to the field of specialization
Assessment:	Bachelor thesis and colloquium
Media:	as required
Literature:	as required

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Module description:	**Internship (c)**
Field:	Communication & Management
Course:	Internship & Seminar
Term:	Winter
Person in charge:	Dipl.-Ing. (FH) Koch
Lecturer:	Teaching staff of Engineering Physics
Language:	English / German
Curriculum correlation:	Bachelor Engineering Physics, 6th semester
form/time:	Seminar and self-learning
Workload:	Attendance: 300 hrs Self study: 60 hrs
CP:	12
Prerequisites acc. syllabus	
Recommended prerequisites:	Physics I – IV; metrology
Aim:	The student will be able to conduct, conceive, analyse, and journalize ambitious physical experiments. He/she will gather operating experience with modern measuring processes.
Content:	Practical assessment in research institute, industrial company or clinic. The students learn to apply their theoretical knowledge in an industrial environment. The phase will be accompanied by a seminar to ensure and depict the progress during the practical phase.
Assessment:	Report, poster and presentation
Media:	as required
Literature:	as required

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Subjects of Specialisation: compulsory optional subjects (cos)

Module description:	**Acoustical measurement technology (cos)**
Field:	Specialisation Sound & Vibration, Biomedical Physics
Course:	Acoustical measurement technology
Term:	Summer
Person in charge:	Prof. Dr. Blau
Lecturer:	Prof. Dr. Blau
Language:	German or English
Curriculum correlation:	BA in Engineering Physics
form/time:	Lecture: 4 hrs/week
Workload:	Attendance: 56 hrs Self study: 124 hrs
CP:	6
Prerequisites acc. syllabus	Basic knowledge of acoustics and signal processing
Recommended prerequisites:	
Aim:	Students are expected to gain an overview of measurement methods frequently used in acoustics. They shall understand the underlying principles, and be able to spot possible measurement errors. In addition, students will be qualified in setting up actual measurements, using generic software for control, signal processing, and result analysis.
Content:	Recapitulation: Basics of signal theory and acoustics Sound pressure level: Definition, broadband level, spectra using filters, spectra using the FFT; Reverberation time I, absorption; Electroacoustical measurements: Transfer functions, nonlinear distortions Room impulse responses: test signals, room-acoustical parameters, reverberation time II; Sound intensity; Sound power: free-field method, diffuse-field method, intensity method; In-situ-measurement of impedances
Assessment:	Written examination or project report
Media:	Blackboard, computer presentations
Literature:	Kraak, W. and Weißing, H.: Schallpegelmeßtechnik. Verlag T Kraak, W. and Weißing, H.: Schallpegelmeßtechnik. Verlag Technik, Berlin 1970 Randall, R. B.: Application of B&K Equipment to Frequency Analysis. 2. Auflage, Brüel & Kjaer, 1977 Harris, C. M.: Handbook of Acoustical Measurements and Noise Control. 3rd edition, McGraw-Hill, New York, 1991 Bendat, J. S. and Piersol, A. G.: Random data: Analysis and measurement procedures, 3. Auflage, Wiley-Interscience, 2000.

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Module description:	**Applied acoustics (cos)**
Field:	Specialisation Sound & Vibration and Biomedical Physics
Course:	Applied and medical acoustics/ lecture with exercise
Term:	Summer
Person in charge:	Prof. Dr. Dr. Kollmeier
Lecturer:	Prof. Dr. Dr. Kollmeier, Dr. Weber, Prof. Dr. Blau
Language:	English or German on demand
Curriculum correlation:	Bachelor Engineering Physics, 4^{th} or 5^{th} semester Fach-Bachelor in Physik, Wahlpflicht, 6^{th} Semester
form/time:	Lecture: 2 hrs/week Exercise: 2 hrs/week
Workload:	Attendance: 56 hrs Self study: 124 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Laboratory experiments within: Acoustics, signal processing and/or medical physics
Aim:	Introduction to applied acoustics and measurement technique including applications in medicine. The modul is segmented into two paragraphs. After finishing the first paragraph, the students are able to produce a bachelor thesis in acoustics or signal processing. After completing both paragraphs it is possible to produce a bachelor thesis in medical acoustics.
Content:	Paragraph on applied acoustics (3 CP): Physical basics of acoustics, vibration and waves, generation, radiation and propagation of sound, acoustic measurements, sound proof, room and building acoustics, electro acoustics/ transducers. Paragraph on medical acoustics (3 CP): Signal processing, evaluating sound, acoustics of voice and speech, pathology of speech, shock waves, photo-acoustic effect; selected chapters of medical acoustics, vibration and ultrasound
Assessment:	Successful attendance of the weekly exercises, 30 min oral exam or presentation
Media:	Script, transparencies, blackboard, data projection, experiments.
Literature:	B. Kollmeier: Skriptum Physikalische, technische und medizinische Akustik. Universität Oldenburg, http://medi.unioldenburg.de/16750.html. G. Müller, M. Möser (Eds.): Taschenbuch der technischen Akustik. Springer, Berlin, 2004 H. Kuttruff: Akustik: eine Einführung. Hirzel, Stuttgart, 2004. D. R. Raichel: The science and applications of acoustics. Springer, Berlin, 2000 J. Blauert and N. Xiang: Acoustics for Engineers. Troy lectures. Springer, Berlin, 2008 A. D. Pierce: Acoustics: An introduction to its physical principles and applications. Acoustical Society of America, Melville (NY), 1994

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Module description:	Angewandte und medizinische Akustik **(cos)**
Field:	Specialization Biomedical Physics
Course:	Angewandte und medizinische Akustik, VL Angewandte und medizinische Akustik, Übung
Term:	Summer
Person in charge:	Prof. Dr. Dr. Kollmeier
Lecturer:	Prof. Dr. Dr. Kollmeier Dr. Reinhard Weber, Junior-Prof. Dr. Poppe; Dr. Uppenkamp, Junior-Prof. Dr.. Verhey;
Language:	German
Curriculum correlation:	Bachelor in Physik, 6. Semester; Bachelor Engineering Physics, 4th or 5th semester
form/time:	Lecture: 2 hrs/week Excersises: 2 hrs/week
Workload:	Attendance: 56 hrs Self study: 124 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Inorganic and organic chemistry, biology (in each case Abitur level), physics (Bachelor level); additionally recommended: Practical course attempts from the progressing and/or block practical course from the areas acoustics and/or medical physics and/or signal processing
Aim:	Students are expected to gain an overview of bio-medical physics. They shall understand the activities of physicists in medicine and be able to analyse current research topics of medical physics.
Content:	Medical bases: Anatomy and physiology of humans, sense and neuro physiology, Psychophysics, pathophysiology of select organ systems, pathology of select diseases, physics in the biomedicine: Methods of biophysics and neuro physics, Roentgen diagnostics, radiotherapy, nuclear medicine, tomography, the medical acoustics/ultrasonic, medical optics and laser applications, Audiologie
Assessment:	Successful attendance of the weekly exercises, 30 min. oral exam and presentation
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	Silbernagl, S., Lang, F.: Taschenatlas der Pathophysiologie, Thieme, 2007 Silbernagel, Despopulos: Taschenatlas der Physiologie, Thieme 2007 Klinke/Silbernagl: Lehrbuch der Physiologie, Thieme, 2005 J.Richter: Strahlenphysik für die Radioonkologie, Thieme. 1998

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Module description:	**Energiemeteorologie (cos)**
Field:	Spezialisierung Renewable Energy
Course:	Energy meteorology
Term:	Summer
Person in charge:	Dr. Heinemann
Lecturer:	Dr. Heinemann
Language:	German
Curriculum correlation:	Bachelor in Engineering Physics, 5th Semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	Transfer of advanced knowledge and generation of scientific authority into the area of the transformation and use of renewable energies on the basis of fundamental complex physical formulations (non-linearity, causality, Intermittenz, Granularity, Fraktality)
Content:	Radiation laws; Radiation reciprocal effect processes/transport in the atmosphere; Satellite remote sensing Satellites; Modelling of solar energy-specific radiation sizes; Forecast of the solar radiation; Energetik of the atmosphere; Motion equations, atmospheric boundary layer, wind profiles, stability, turbulence, mesoskalige modelling, wind energy potential, wind achievement forecast.
Assessment:	oral examination or report
Media:	Blackboard, transparencies, data projector presentation
Literature:	T. Burton et. al., *Wind energy handbook* ,Wiley (2001) R. Gasch, J. Twele, *Wind power plants*, Solarpraxis Berlin (2002) A. deVos, *Endoreversible Thermodynamics for Solar Energy Conversion*, P. Würfel, *Physik der Solarzelle,* VCH-Wiley, Weinheim (2003) K.-N. Liou, *An Introduction to Atmospheric Radiation*, Academic Press (1980) R. Stull, *An Introduction To Boundary Layer Meteorology*, Kluwer Academic Publ. (1988)

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Module description:	**Femtosecond Laser Technology (cos)**
Field:	Specialisation Laser & Optics
Course:	Femtosecond Laser Technology
Term:	Summer
Person in charge:	Prof. Dr. Teubner
Lecturer:	Prof. Dr. Teubner
Language:	English (German)
Curriculum correlation:	Photonik (BA) Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Basics of optics, (basics of laser physics)
Aim:	Starting from their basic knowledge of optics, the students do learn the special aspects of optics on ultrashort time scales which do not play a role in standard optics. The module yields a basic knowledge of the physics of femtosecond light pulses and their interaction with matter, as well as the technology of femtosecond lasers.
Content:	Linear and non-linear optics of ultrashort pulses such as: amplitude, phase and spectral phase of the electric field, chirp, phase and group velocity, dispersion, pulse compression, self focusing, self phase modulatiom, frequency conversion, multi photon effects; femtosecond laser pulse generation with various schemes, measurement of ultrashort pulses
Assessment:	1 hr written final examination
Media:	black board, power point, practical work in the laboratory
Literature:	Rullière: Femtosecond Laser Pulses (Springer); Diels, & Rudolph: Ultrashort Laser Pulse Phenomena (Academic Press)

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Module description:	**Laserdesign (cos)**
Field:	Specialisation Laser & Optics
Course:	Laser Design, Lecture
Term:	Winter
Person in charge:	Prof. Dr. Struve
Lecturer:	Prof. Dr. Struve
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	Specialisation/Laser Physics
Recommended prerequisites:	Basic knowledge in atomic physics, optics and laser physics
Aim:	Students acquire basic knowledge on optical components used in lasers and on design of the most important laser types
Content:	• Optical components, e.g. mirrors, polarizers • Electrooptical and acoustooptical modulators • Gas, liquid and solid-state lasers • Frequency Doubling
Assessment:	1 hr. written final examination or homework
Media:	Blackboard, tranparencies, data projector presentation
Literature:	B. Struve, Laser (Verlag Technik, 2001) A. E. Siegman, Lasers (University Science Books, 1998)

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Module description:	**Laserphysik (cos)**
Field:	Specialisation Laser & Optics, Regenerative Enrgies, Materials Sciences, Biomedical Physics
Course:	Laser Physics, Lecture
Term:	Summer
Person in charge:	Prof. Dr. Struve
Lecturer:	Prof. Dr. Struve
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 4th or 5th semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic knowledge in atomic physics and optics
Aim:	Students acquire basic knowledge on generation of laser radiation and on technical realization of the most important operation modes
Content:	• Interaction processes between optical radiation and atoms • Optical amplification, laser principle • Optical resonators, beam propagation • Q-switching, cavity dumping, mode locking • Wavelength tuning
Assessment:	1 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	B. Struve, Laser (Verlag Technik, 2001) A. E. Siegman, Lasers (University Science Books, 1998)

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Module description:	**Lasers in Medicine I (cos)**
Field:	Specialisation Laser & Optics / Biomedical Physics
Course:	Lasers in Medicine
Term:	winter
Person in charge:	Prof. Dr. Neu
Lecturer:	Prof. Dr. Neu
Language:	Englisch
Curriculum correlation:	Pflicht: Photonik (BA) , Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Laser physics, Technical Optics
Aim:	The students are enabled to understand basic laser biotissue interaction processes based on the knowledge of optical and thermal properties of biotissue. The students are able to describe the principle function of a laser, distinguish between the different laser types and designs regarding medical laser systems. The students have a basic knowledge on beam guiding techniques, medical applicators, and safety requirements. The students gain an overview on lasers in medicine and a first insight into clinical laser applications via an excursion to a clinic.
Content:	Optical and thermal properties of biotissue Basic interaction processes of light and biotissue Medical laser systems Beam guiding and applicators Introduction to lasers in medicine Laser safety and regulatory affairs in medicine Insight into clinical laser therapy (Excursion)
Assessment:	1 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	Berlien, Hans-Peter; Müller, Gerhard J., Breuer, H.; Krasner, N.; Okunata, T.; Sliney, D. (Eds.): Applied Laser Medicine. Springer-Verlag, 2003. ISBN: 978-3-540-67005-6 Niemz, Markolf H.: Laser-Tissue Interactions. Fundamentals and Applications.Series: Biological and Medical Physics, Biomedical Engineering. Springer-Verlag, 3rd enlarged ed. 2003. 2nd printing, 2007. ISBN: 978-3-540-72191 Sliney, D. Trokel, S.L.: Medical Lasers and Their Safe Use. Springer-Verlag 1993. ISBN: 978-3540978565.

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Module description:	**Lasers in Medicine II (cos)**
Field:	Specialisation Laser & Optics, Biomedical Physics
Course:	Advanced Lasers in Medicine
Term:	Winter
Person in charge:	Specialisation Laser & Optics
Lecturer:	Prof. Dr. Neu
Language:	Englisch
Curriculum correlation:	Photonik (BA) , Bachelor Engineering Physics, 4th or 5th semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Laser physics, Technical Optics, Lasers in medicine I
Aim:	The students are able to analyze and modell in depth optical properties of biotissue. They can explain laser-tissue interaction in depth. The students are able to design and evaluate medical laser systems and assign specific therapeutical areas. Special emphasis is put into dositmery and minimal invasive techniques. An excursion to a university clinic enables the students to transfer the aquired course knowledge to practical experience.
Content:	Light propagation in biotissue Optical diagnostics and imaging, simulation, computer modelling Photochemical, photothermal, photomechanical interaction mechanisms Minimal invasive surgical therapies Medical laser applications Laseranwendungen Lasers in clinical diagnostics Dosimetry Excurison to a clinic; clinical laser applications
Assessment:	1 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	Berlien, Hans-Peter; Müller, Gerhard J., Breuer, H.; Krasner, N.; Okunata, T.; Sliney, D. (Eds.): Applied Laser Medicine. Springer-Verlag, 2003. ISBN: 978-3-540-67005-6 Niemz, Markolf H.: Laser-Tissue Interactions. Fundamentals and Applications.Series: Biological and Medical Physics, Biomedical Engineering. Springer-Verlag, 3rd enlarged ed. 2003. 2nd printing, 2007. ISBN: 978-3-540-72191 Sliney, D. Trokel, S.L.: Medical Lasers and Their Safe Use. Springer-Verlag 1993. ISBN: 978-3540978565. Puliafito, Carmen A: Laser Surgery and Medicine. Principles and Practice. J. Wiley&Sons, 1996. ISBN 0-471-12070-7 Recent publications (www.medline.de)

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Module description:	**Laser spectroscopy (cos)**
Field:	Specialisation Laser & Optics, Materials Sciences, Regenerative Energies
Course:	Laser spectroscopy
Term:	Winter
Person in charge:	Prof. Dr. Neu
Lecturer:	Prof. Dr. Neu
Language:	Englisch
Curriculum correlation:	Bachelor Engineering Physics, 5th semester Fach-Bachelor in Physik, 5th Semester Zwei-Fächer-Bachelor in Physik, 3rd Semester
form/time:	Lecture: 2 hrs/week
Labor intensity:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Optics, Atomic and molecular physics, basics in quantum mechanics
Aim:	Students learn the fundamental principles of laser spectroscopy on atoms and molecules; applications of laser spectroscopy
Content:	Optical spectroscopy and line shapes Atomic and molecular spectra Doppler limited spectroscopy High resolution single photon spectroscopy Time resolved laser spectroscopy Multi photon spectroscopy Doppler free spectroscopy Applications of laser spectroscopy
Assessment:	Successful attendance of the weekly exercises, 2 hrs written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	W. Demtröder, Laserspektroskopie, Springer, 5.Aufl. 2007; engl. Laser Spectroscopy, Springer, 3nd ed. 2003 W. Demtröder: Atoms, Molecules, and Photons. Springer, Berlin, 2005 H. Haken, H. C.Wolf: Atom- und Quantenphysik. Springer, Berlin 2004 S. Svanberg: Atomic and molecular spectroscopy basic aspects and practical applications. Springer, 2001. A. Corney: Atomic and laser spectroscopy. Clarendon Press, 1988. P. Hannaford: Femtosecond laser spectroscopy. Springer, New York , 2005.

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Module description:	**Materialbearbeitung mit Laserstrahlen 1 (cos)**
Field:	Specialisation Laser & Optics, Materials Sciences
Course:	Material Processing with Lasers I
Term:	Summer
Person in charge:	N.N. (Nachfolge Prof. Dr.-Ing. Rothe)
Lecturer:	N.N. (Nachfolge Prof. Dr.-Ing. Rothe)
Language:	German
Curriculum correlation:	Photonik (BA) Bachelor Engineering Physics, 4th or 5th semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Knowledge in physics, optics, production engineering
Aim:	Fundamental knowledge of the characteristics of the laser beam, knowledge of procedures of the material processing with laser beams
Content:	Overview of the procedures of the material processing with laser beams: Procedure, allocation of the procedures in relation to production engineering the laser beam as tool: Jet characteristics, Gauss jets, other jets, jet transformation the material: Materials, characteristics reciprocal effect between laser beam and material: Penetration behavior, the treatment laser plant: Laser apparatuses in the material processing, guidance machine, remark examples of laser plants the individual manufacturing processes: Surface processing, joining process, separation procedure, material property changing examples from the industriellen manufacturing
Assessment:	1 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	Script

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Module description:	**Materialbearbeitung mit Laserstrahlen 2 (cos)**
Field:	Specialisation Laser & Optics
Course:	Material Processing with Lasers II
Term:	Summer
Person in charge:	N.N. (Nachfolge Prof. Dr.-Ing. Rothe)
Lecturer:	N.N. (Nachfolge Prof. Dr.-Ing. Rothe)
Language:	German
Curriculum correlation:	Photonik (BA) Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Knowledge of material processing with lasers
Aim:	Knowledge of the physical-technical procedures of the individual manufacturing processes with laser beams; Ability for the estimation of favorable working parameters; The participants should be able to understand the procedures of the material processing with laser beams and evaluate the tasks of manufacturing
Content:	Deepening treatment of the manufacturing processes in the areas: Treatment of outer zones adding separation under view of the physical-technical operational sequence
Assessment:	1 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	script

Module description:	**Micro Technology (cos)**
Field:	Specialisation Laser & Optics
Course:	Micro Technology
Term:	Summer / Winter
Person in charge:	Prof. Dr. Teubner
Lecturer:	Prof. Dr. Teubner
Language:	English (German)
Curriculum correlation:	Photonik (BA) Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	The students get introduced to the field of micro technology (MEMS and MOEMS) They should be able to work in that field in industry.
Content:	Materials for micro technology, thin layers, clean rooms, methods and processes for the generation and modification of thin films such as evaporation, sputtering, CVD, diffusion, doping etc., etching; special emphasis is put on lithographic methods and laser micro machining
Assessment:	1 hr written final examination
Media:	black board, power point, practical work in the laboratory
Literature:	Mescheder: Mikrosystemtechnik (Teubner Verlag); Hilleringmann: Mikrosystemtechnik (Teubner Verlag); Völklein& Zetterer: Praxiswissen Mikrosystemtechnik (Vieweg) W. Menz, J. Mohr, O. Paul: Microsystem Technology Print ISBN: 9783527296347 Online ISBN: 9783527613007 DOI: 10.1002/9783527613007

Module description:	**Optik der Atmosphäre und des Ozeans (cos)**
Field:	Specialisation Renewable Energy
Course:	Optik der Atmosphäre und des Ozeans Optics of the atmosphere and the ocean, lecture, exercise and sailing time (if available)
Term:	Winter
Person in charge:	Dr. Reuter
Lecturer:	Dr. Reuter; NN PostDoc
Language:	German
Curriculum correlation:	Bachelor Engineering Physics, 4^{th} or 5^{th} semester Fach-Bachelor in Physik, 6^{th} Semester
form/time:	Lecture: 2 hrs/week Exercise: 1hrs/week Excursion: 3 days (if available)
Workload:	Attendance: 42 hrs Self study: 48 hrs Excursion: 72 hrs (if available)
CP:	3
Prerequisites acc. syllabus	Experimental physics I – IV, metrology
Recommended prerequisites:	
Aim:	Students will be able to understand the principles of optics in relation to the physics of the atmosphere and the ocean. This includes the fundamentals of optical interaction between light diffusion and experimental analysis of irradiance including the use of models to descripe the radiative transfer.
Content:	Methods of radiometry, Theory of radiative transport, absorption and scattering, spectra of the sun, athmosphere, aerosol, light in the ocean, remote sensing
Assessment:	Successful attendance of the weekly exercises, 1 hr written exam or 30 min oral exam
Media:	Script, transparencies, blackboard, Beamer presentation, experiments.
Literature:	D. C. Mobley: Light and Water. Academic Press, San Diego (CA), 1994 I. S. Robinson: Measuring the Oceans from Space. Springer, Berlin, 2004 J. T. O. Kirk: Light and Photosynthesis in Aquatic Ecosystems. Cambridge University Press, Cambridge, 1994

Module description:	**Optische Kommunikationstechnik (cos)**
Field:	Specialisation Laser & Optics
Course:	Optical communication technology
Term:	summer
Person in charge:	Prof. Dr. Brückner
Lecturer:	Prof. Dr. Brückner
Language:	German
Curriculum correlation:	Photonik (BA) Engineering Physics 4th semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Optics, electronics, solid state physics
Aim:	Basic knowledge of fiber optical fiber systems, Competence to design and evaluate simple fiber systems
Content:	Optical fibers Signal attenuation and dispersion in optical fibers Fundamentals of optical data transmission Optical fiber amplifiers, fiber lasers Optical fiber connections
Assessment:	1 hr written examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	H.-G. Unger: Optische Nachrichtentechnik 1, Hüthig Verlag, 1993 H.-G. Unger: Optische Nachrichtentechnik 2, Hüthig Verlag, 1994 E. Voges, K. Petermann: Optische Kommunikationstechnik. Handbuch für Wissenschaft und Indutrie, Springer Verlag, 2002 J. M. Senior: Optical Fiber Communications. Principles and Practice, Prentice Hall, 1992

Module description:	**Optical Measuring Technology (cos)**
Field:	Specialisation Laser & Optics
Course:	Optical Measuring Technology
Term:	5
Person in charge:	Prof. Dr. Teubner
Lecturer:	Prof. Dr. Teubner
Language:	Englisch
Curriculum correlation:	Photonik (BA) Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	Optical systems
Aim:	Knowledge of laser applications in the field of measurement and non – destructive testing.
Content:	Principles of optical measurement systems Signals and signal processing Introduction to image processing Long distance measurement with lasers Triangulation sensors, Auto focus sensors Laser interferometers, Laser velocimeters, Laser vibrometers, Laser anemometers, Laser scanners Light intersection techniques Digital holography Holographic interferometry Speckle measurement techniques: Speckle correlation, Speckle photography, Speckle interferometry, Speckle shearography Moiré interferometry Quantitative evaluation of interference patterns Computer supported atomised evaluation of fringe patterns Introduction to fluidmechanic measurement techniques Shadow measurement techniques Laserinterferometry Velozimetry Laserdoppleranemometry Particle image Velozimetry Laboratory sessions will supplement the lecture material
Assessment:	2 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	Script

Module description:	**Optoelektronik (cos)**
Field:	Specialisation Laser & Optics
Course:	Optoelektronics
Term:	4
Person in charge:	Prof. Dr.Brückner
Lecturer:	Prof. Dr. Brückner
Language:	German
Curriculum correlation:	Photonik (BA) Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 32 hrs
CP:	2
Prerequisites acc. syllabus	
Recommended prerequisites:	Atoms and Molecules, Optics, Electronics, Solid state physics
Aim:	Acisition of physical and technical properties of optoelectronic components; ability to design and analyse simple optoelectronics systems
Content:	Electronics in solids Semicundutor junctions Optical radiation sources Optical radiation detectors Non linear optics
Assessment:	1 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	Bludau: Halbleiter-Optoelektronik, Hanser Verlag Paul: Optoelektronische Halbleiterbauelemente, Teubner Studienskripte Saleh, Teich: Fundamentals of Photonics, Wiley & Sons, 2007

Module description:	**Physikalische Grundlagen der Photovoltaik (cos)**
Field:	Specialisation Renewable Energy
Course:	Physikalische Grundlagen der Photovoltaik, VL
Term:	Winter
Person in charge:	Dr. Riedel
Lecturer:	Dr. Riedel
Language:	German
Curriculum correlation:	Bachelor in Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	Transfer of advanced knowledge and generation of scientific authority into the area of the transformation and use of renewable energies on the basis of fundamental complex physical formulations (non-linearity, causality, Intermittenz, Granularity, Fraktality)
Content:	Solar power; Semiconductor physics; Radiation transformation and transport; pn transition; Semiconductor components; Physics of the solar cell; High-efficient solar cell; Analytics and metrology
Assessment:	Oral examination or report
Media:	Blackboard, transparencies, data projector presentation
Literature:	A. deVos, *Endoreversible Thermodynamics for Solar Energy Conversion*, P. Würfel, *Physik der Solarzelle*, VCH-Wiley, Weinheim (2003) K.-N. Liou, *An Introduction to Atmospheric Radiation*, Academic Press (1980)

Module description:	**Vakuum- und Kryotechnik (cos)**
Field:	Specialisation Materials Science
Course:	Vacuum and Cryotechnics
Term:	4
Person in charge:	Prof. Dr. Gärtner
Lecturer:	Prof. Dr. Gärtner
Language:	Deutsch
Curriculum correlation:	Photonik (BA) Bachelor in Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 32 hrs
CP:	2
Prerequisites acc. syllabus	
Recommended prerequisites:	Basic physic courses
Aim:	Vacuum and kryotechnical fundamental knowledge and understanding of thin layer production.
Content:	Kinetic gas theory transportation phenomena pump types pressure measurement and remainder gas analysis generation of low temperatures
Assessment:	1 hr written final examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	Wutz: Handbuch Vakuumtechnik : Theorie und Praxis ; mit 109 Tabellen / Karl Jousten (Hrsg.). - 9., überarb. und erw. Aufl. - Wiesbaden : Vieweg, 2006, ISBN: 3-8348-0133-X Dushman: Scientific foundations of vacuum technique, Wiley, 1960

Module description:	**Werkstoffanalytik (cos)**
Field:	Specialisation Materials Science
Course:	X-Ray physics and particle analysis of matter
Term:	Summer
Person in charge:	Prof. Dr. Gärtner
Lecturer:	Prof. Dr. Teubner
Language:	German
Curriculum correlation:	Compulsory: Photonik (BA) Bachelor Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	6
Prerequisites acc. syllabus	
Recommended prerequisites:	Atomic and Molecular Physics, Solid State Physics
Aim:	Knowledge of the physical and technical procedures for the analysis of materials
Content:	Top illumination microscopy transmitted light microscopy raster electron microscopy texture analysis
Assessment:	1 hr written examination
Media:	Blackboard, transparencies, data projector presentation
Literature:	Script, recent publications

Module description:	**Windenergie (cos)**
Field:	Specialization Renewable Energy
Course:	Wind Energiy, lecture
Term:	Winter
Person in charge:	Prof. Dr. Peinke
Lecturer:	Prof. Dr. Peinke
Language:	German
Curriculum correlation:	Bachelor in Engineering Physics, 4^{th} or 5^{th} semester
form/time:	Lecture: 2 hrs/week
Workload:	Attendance: 28 hrs Self study: 62 hrs
CP:	3
Prerequisites acc. syllabus	
Recommended prerequisites:	
Aim:	Transfer of advanced knowledge and generation of scientific authority into the area of the transformation and use of renewable energies on the basis of fundamental complex physical formulations (non-linearity, causality, Intermittenz, Granularity, Fraktality)
Content:	Physical properties of fluids, wind characterization and anemometers, aerodynamic aspects of wind energy conversion, dimensional analysis, (p-theorem), and wind turbine performance, design of wind turbines, electrical systems.
Assessment:	oral examination or report
Media:	Blackboard, transparencies, data projector presentation
Literature:	T. Burton et. al., *Wind energy handbook* ,Wiley (2001) R. Gasch, J. Twele, *Wind power plants*, Solarpraxis Berlin (2002)